

XI.2 Electrochemical Hydrogen Compressor (Phase I Project)

Mr. David P. Bloomfield

Analytic Power, LLC

2-X Gill Street

Woburn, MA 01801

Phone: (781) 935-1333; E-mail: david.bloomfield@analytic-power.com

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Today's mechanical, hydrogen compression technology is inefficient, costly, unreliable, and lacking in durability. The inefficiency is derived from the fact that piston and diaphragm compressors are, essentially, isentropic machines. The other problems mentioned above are common to electromechanical systems that have many types of moving parts. This project will develop an electrochemical hydrogen compressor as a highly modular, isothermal device with no moving parts. Phase I will demonstrate the feasibility of the hydraulic cathode, which circulates water through the compressor cathode, both cooling the cell and humidifying the membrane. By permitting the use of dry hydrogen in the anode, the fundamental problem of anode flooding, a principal difficulty in prior designs, can be avoided. Phase I also will demonstrate the use of improved, corrosion resistant materials and coatings. In Phase II, using a stack of the cells designed and built in Phase I, an extended lifetime test will be run.